



الهيئة السعودية للتخصصات الصحية
Saudi Commission for Health Specialties

Sleep Medicine



سِرِّهِ مُحَمَّدٍ

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TABLE OF CONTENTS

Contributors	3
Copyright Statements	4
AKNOWLEDGEMENT	5
Table Of Contents	6
Introduction	7
ABBREVIATIONS USED IN THIS DOCUMENT	9
PROGRAM ENTRY REQUIREMENTS	10
LEARNING AND COMPETENCIES	11
CONTINUUM OF LEARNING	15
TRACK-1	15
TRACK-2	18
TEACHING METHODS	23
RESEARCH	25
ASSESSMENT	25
PROGRAM AND COURSES EVALUATION	28
POLICIES AND PROCEDURES	28
APPENDICES	29
REFERENCES	48

INTRODUCTION

5.1. Context of Practice

Sleep disorders are prevalent, underdiagnosed, and undertreated in Saudi Arabia, partly due to a shortage of sleep medicine specialists and sleep medicine facilities. The waiting list for sleep studies in Saudi Arabia is of significant concern and was last reviewed in 2007, highlighting the extent of sleep disorders in the Kingdom (1). Two previous studies assessed the prevalence of risks and symptoms of the major sleep disorder of obstructive sleep apnea (OSA) among middle-aged Saudi men and women in a primary care setting using the Berlin questionnaire (a validated questionnaire that stratifies subjects into high-risk and low-risk categories). They revealed that 3 out of 10 Saudi men and 4 out of 10 Saudi women are at a high risk of OSA (2-4). A subsequent study used polysomnography to assess OSA prevalence in a sample of Saudi school employees aged 30 to 60 years (5). The prevalence of OSA (defined as an apnea hypopnea index (AHI) of ≥ 5 /hr of sleep) was 11.2% and 4.0% in men and women, respectively (5). Another study assessed sleep-disordered breathing using type II comprehensive unattended polysomnography in Saudi patients admitted to the coronary care unit with acute coronary syndrome both during the acute event and six months later and reported that 56% of these patients had OSA (AHI > 10 /hr) (6).

It is estimated that there is more than a 10-year delay between symptom onset and referral to sleep disorder centers for Saudi women with OSA (7, 8), which supports the belief that sleep disorders in Saudi Arabia remain under-recognized and underdiagnosed.

A few studies have also assessed the prevalence of other sleep disorders in the Saudi population. The prevalence of obesity hypoventilation syndrome in patients referred to sleep disorder specialists with a clinical suspicion of OSA was 8.5% (9). The estimated prevalence of narcolepsy with cataplexy in Saudis is 40/100,000 people (10, 11), which is within the range reported in other estimates of the prevalence of narcolepsy with cataplexy of 25 to 50 per 100,000 people (12). The prevalence of restless leg syndrome among Saudis is reported to be 5.7–6.4% (13, 14), which falls within previously reported ranges of RLS prevalence (3–12%) in other countries (13, 15). A recent study reported that the prevalence of insomnia with daytime dysfunction in patients attending primary care centers was 57.1% (16). Another recent study assessing the prevalence of insomnia (defined as difficulty initiating sleep, early morning awakening, or frequent awakening associated with daytime dysfunction) in employees and visitors at a medical center was 78% (75–79%), with a higher prevalence in women, 89% (86–90%), than in men, 70% (68–73%) (17).

Sleep medicine is a distinct specialty in medical practice. Patients with sleep disorders undergo special assessment, which includes a combination of clinical evaluation and sleep monitoring and subsequent application of treatment modalities using various interventions, including medications, medical devices, surgical procedures, education, and behavioral techniques. Sleep medicine fellowship programs require a minimum of 12 months of intensive training for a Fellow to obtain the required competencies in the subspecialty with sufficient expertise to run a multidisciplinary team. Sleep medicine is a rapidly evolving specialty in medicine that has become an essential specialty service in all clinical and academic institutions. Over the past 40 years, sleep medicine and practice have expanded and developed immensely to diagnose and treat the increasing number of different sleep (related) disorders. Some practitioners and medical licensing authorities believe that sleep disorder solely means OSA. However, the International Classification of Sleep Disorders (ICSD-3) includes seven major categories of sleep disorders: insomnia, sleep-related breathing disorders, central disorders of hypersomnolence, circadian rhythm sleep-wake disorders, sleep-related movement disorders, parasomnias, and other sleep disorders that comprise more than 87 sleep disorders (18). Consequently, the number of clinical sleep facilities needed to diagnose and treat patients with sleep disorders has increased worldwide to meet the demand. Nevertheless, unfortunately, this has led to malpractice by sleep medicine practitioners who are not qualified or licensed to treat patients with sleep disorders. Hence, structured training programs have been implemented in developed countries (19).

According to a national survey (2013), sleep medicine diagnostic and therapeutic centers are located in three cities: Riyadh (6 sleep facilities), Jeddah (7 sleep facilities), and Dammam (5 sleep facilities) (20); therefore, more specialists are needed to cover all regions and cities of Saudi Arabia. The number of sleep medicine specialists—defined by the Saudi Commission for Health Specialties (SCFHS) as doctors who completed a minimum of six months of formal full-time fellowship training in sleep medicine—in the national survey (2013) was 37, which translates to 0.012/100,000 people (20)—much lower than the standards in developed countries.

Despite the above, Saudi Arabia is considered one of the leading countries in sleep medicine practice and training in the region; two academic centers have started Sleep medicine fellowship programs. In Riyadh, King Saud University (KSU) took an important step in developing the first structured fellowship program in sleep medicine in 2009 (21, 22). Subsequently, a high diploma program in sleep medicine was introduced in 2016 at King Abdulaziz University (KAU) in Jeddah.

Moreover, the SCFHS acted in advance of several developed countries by accrediting sleep medicine specialists and technologists in 2012 (23-25). This step allowed for guidelines for the expected competencies in practicing sleep medicine and for sleep technologists. The licensing of sleep medicine practitioners and technicians implies that local health authorities recognize sleep medicine as a distinct medical specialty, which has enhanced the demand for sleep medicine services as a medical specialty. Therefore, to bring all previous efforts to fruition and meet the increasing demands on the specialty, it is essential to establish a national interdisciplinary training program to serve the entire country under the umbrella of the SCFHS (through a Saudi Board of Sleep Medicine).

As a multidisciplinary specialty, sleep medicine accepts medical doctors from different backgrounds—pulmonary medicine, psychiatry, neurology, internal medicine, critical care medicine, family medicine, and otolaryngology.

The establishment of the National Sleep Medicine Training Program will enable Saudi Arabia to accommodate the expanding demands for sleep medicine services and enhance its leading role in the region in both clinical sleep medicine service and sleep medicine research. This national program will be the first of its kind in the Middle East, a huge step forward after launching regulations and accreditation for sleep physicians and technologists in 2013.

5.2. Goals and Responsibilities of Curriculum Implementation

This curriculum ultimately seeks to guide trainees to become competent in their respective specialties, which requires significant effort and coordination from all stakeholders involved in postgraduate training. As “adult learners,” trainees must be proactive, fully engaged, and exhibit the following: a careful understanding of learning objectives, self-directed learning, problem-solving, an eagerness to apply oneself to learning from feedback and formative assessment while utilizing reflective practice, and self-awareness and willingness to ask for support when needed. The program director plays a vital role in ensuring the successful implementation of this curriculum. Moreover, training committee members, particularly the program administrator and chief resident, significantly impact the implementation of the program. Trainees should be called to share responsibility in curriculum implementation. The SCFHS applies the best training governance models to achieve the highest training quality. Additionally, academic affairs in training centers and the regional supervisory training committee play a major role in training supervision and implementation. The Adult Sleep Medicine Specialty Scientific (Council/Committee) will guarantee that this curriculum’s content is continuously updated to match the highest standards in postgraduate education of each trainee’s specialty.

VI. Abbreviation Used in This Document

CAP- Cyclic Alternating Pattern

EEG- Electroencephalography

EOG- Electrooculography

EMG- Electromyography

ICSD – International Classification of Sleep Disorders

MSLT- Multiple Sleep Latency Test

MWT- Maintenance of Vigilance Test

PAP- Positive Airway Pressure

SDC- Sleep Disorders Center

OSA- Obstructive Sleep Apnea

AHI- Apnea Hypopnea Index

SRBD- Sleep-Related Breathing Disorders

PLMD- Periodic Limb Movement Disorder

PLMS- Periodic Leg Movements during Sleep

PLMW- Periodic Leg Movements during

Wakefulness

PSG- Polysomnography

REM- Rapid Eye
Movement

NREM- None-Rapid Eye Movement

RWA- REM Without Atonia

AASM- American Academy of Sleep Medicine

RLS- Restless Legs Syndrome

SIT- Suggested Immobilization Test

VII. PROGRAM ENTRY REQUIREMENTS

7.1 The entry requirements shall comply with the Executive Policy of the SCFHS on Admission and Registration

7.2 Admission Requirements

Please refer to the updated executive policy of SCFHS on admission and registration.

Website: www.scfhs.org.sa

VIII. LEARNING AND COMPETENCIES

8.1 Introduction to Learning Outcomes and Competency-Based Education

8.1.1 Medical Expert

- 8.1.1.1 Demonstrate the competency and skills required to manage common sleep disorders at the level of a consultant. The Fellow will acquire the requisite knowledge, skills, and attitudes to be able to recognize, investigate, and manage adult sleep disorders. The Fellow will also learn the appropriate indications for referral of patients to physicians with additional training/expertise in sleep medicine.
- 8.1.1.2 Extract appropriate history and perform the relevant physical examination of patients with sleep disorders pertinent to evaluating the seven major sleep disorders, according to ICSD-3: insomnia, sleep-related breathing disorders, central disorders of hypersomnia, circadian rhythms, sleep-wake-related disorders, parasomnia, sleep-related movement disorders, and other disorders with a concentration on epidemiology, pathophysiology, prevention, clinical presentation, laboratory evaluation, treatment, and prognosis. Moreover, the Fellow must be familiar with the indications and interpretations of commonly used sleep disorder questionnaires, sleepiness assessment questionnaires, and sleep/wake diaries.
- 8.1.1.3 Demonstrate diagnostic and therapeutic skills for the assessment and management of sleep disorders, including insomnia, sleep-related breathing disorders, central disorders of hypersomnia, circadian rhythms, sleep-wake-related disorders, parasomnia, and sleep-related movement disorders, as well as demonstrate the ability to conduct all forms of management—medications, medical devices, referral for surgical procedures, education, and behavioral techniques.
- 8.1.1.4 Demonstrate the ability to recognize, evaluate, and manage complex cases and the importance of specialty referral whenever indicated (e.g., recognizing abnormal movement epileptologist early in the course of disease for appropriate management).
- 8.1.1.5 Demonstrate knowledge of the clinical use, indications, and effective use of all technical aspects of sleep testing procedures—patient instrumentation, signal acquisition and processing, and troubleshooting recorded signals, including recognizing and correcting recording artifacts. Competencies in the scoring of diagnostic procedures' raw data and reporting sleep study data in the context of clinical presentation data are necessary.
- 8.1.1.6 Interpret actigraphy, cardiorespiratory ambulatory studies (home sleep apnea test), and polysomnographic type-I sleep studies. Competency in scoring sleep studies will comprise recognition of NREM and REM sleep stages and the AASM scoring criteria for arousals from sleep and identification of normal or disturbed sleep architecture.
- 8.1.1.7 Detect and interpret abnormal waveforms or neurological events such as seizure activity, conduct the scoring of periodic limb movements, recognize different respiratory events, including apneas, hypopneas, upper airway resistance events, and hypoventilation, and provide the interpretation of histograms (including hypnograms).
- 8.1.1.8 Outline the indications, advantages, and limitations of type-1 polysomnographic testing, portable sleep studies, actigraphy, multiple sleep latency, and maintenance of wakefulness testing.
- 8.1.1.9 Demonstrate knowledge of theoretical and practical aspects of the use of all modes of PAP therapy (conventional vs. auto-adjusting continuous PAP [CPAP]), all modalities of bi-level (pressure support) mode, adaptive-servo ventilation, and oxygen therapy in the treatment of breathing-related sleep disorders.

By the end of the training, the trainer will

A. Demonstrate the following practical skills:

- a. Interpret polysomnograms (PSG) at SDC. This program requires a minimum of 100 PSG interpretations for sleep medicine fellowship completion, although there is ample opportunity for more.
- b. Interpret Multiple Sleep Latency Testing (MSLT) at the SDC (minimum 10 for the fellowship).
- c. A minimum of 100 new patients and 150 follow-up patients are documented in the Fellow's logbook throughout the sleep fellowship. At least 50 new patients must include a diagnosis other than sleep-disordered breathing. Evaluation of at least 10 pediatric patients is also required. Two clinics and one every other week clinic at the pediatric sleep clinic should provide ample exposure to the required number of patients. Fellows will also attend the respective clinics in other subspecialty rotations. Overall, there are many patients with various sleep disorders that meet the minimum requirements.
- d. Set up at least five patients for overnight studies
- e. Take sleep lab call and attend sleep business meetings
- f. Teach rotating residents and students
- g. It is strongly recommended to write at least one article that is preferably a result of the Fellow's sleep research project, ongoing throughout the sleep fellowship.
- h. Must attend all sleep lecture series ($\geq 80\%$) and complete required readings.

B. Demonstrate adequate knowledge by the end of their rotations (for more details, see Appendix 1):

a. Physiology of sleep:

- Sleep and wakefulness physiology and its relation to age
- The control of sleep
- The proposed biological functions of sleep
- EEG signals during wakefulness, sleep, and different sleep stages
- Familiarity with the latest AASM scoring criteria of sleep stages
- What happens to body functions during sleep:
 - Brain activity
 - The control of motor activities of skeletal muscles
 - Sensations
 - Autonomic nervous system activity
 - Cardiovascular functions
 - Breathing and respiratory functions
 - Metabolism
 - Hormonal activities and secretion; circadian rhythm-related hormones vs. sleep-related hormones
 - Changes in core internal temperature (thermoregulation)
 - Health consequences of acute and chronic sleep deprivation
 - The proposed functions of NREM and REM sleep stages

b. Chronobiological characteristics of sleep:

- Central and peripheral circadian clocks, their interactions, and their influence on circadian rhythms, such as temperature and hormones, and their relation to cardiometabolic changes
- Chronobiological models of sleep regulation
- Methods for assessing time-dependent variations of sleepiness and alertness
- Circadian rhythm disorders (diagnosis and management)

c. Diagnostic procedures and assessment of sleep disorders:

- Ability to perform clinical and psychological workup (interview and examination)
- Adequate knowledge of diagnostic approach to diseases listed in ICSD-3 (2014)
- Mastering various sleep disorders diagnostic procedures:
 - PSG (type-I sleep studies)
 - The utility of daytime PSG
 - Cardiorespiratory polygraphy
 - MSLT and MWT
 - Sleep/wake questionnaires
 - Basic knowledge of other diagnostic tests (e.g., neuropsychological tests)

d. Treatment of sleep disorders:

- PAP therapy and its different modes
- Strategies to enhance PAP adherence
- Telemonitoring of PAP therapy
- The interpretation of the PAP stored data
- Cognitive behavioral therapy and other psychotherapeutic procedures
- Sleep hygiene; light therapy
- The influence of medication on sleep
- Drug therapy for sleep disorders
- Surgical procedures for sleep-disordered breathing: indications and side effects
- Dental appliances for OSA.

Appendix 2 presents the medical and scientific topics that need to be covered during the fellowship training.

Note:

The training committee will be responsible for preparing the timetable and rotations for all participating candidates. Candidates will rotate between assigned hospitals regardless of their original hospital affiliation as stated by the SCFHS regulations.

8.1.2 Communicator

- 8.1.2.1 Communicate effectively with patients, families, other physicians, and allied health professionals. This includes providing concise, written, and dictated consultation notes and letters.
- 8.1.2.2 Maintain complete and accurate medical records.
- 8.1.2.3 Demonstrate the ability to obtain a thorough yet relevant history from patients with sleep-related difficulties.
- 8.1.2.4 Present and discuss sleep-related topics at teaching and patient care rounds.
- 8.1.2.5 Communicate their clinical impression clearly and concisely in both written and oral formats to the referring physician and other medical personnel.
- 8.1.2.6 Communicate the findings of sleep testing procedures in oral and written forms.

8.1.3 Health Advocate

- 8.1.3.1 Recognize and respond to social determinants of health status, including socioeconomic status, financial resources, social support, and other public health issues.
- 8.1.3.2 Examine the impact of economic and social factors that predispose to and/or exacerbate sleep disorders.
- 8.1.3.3 Show an understanding of the importance of preventive strategies in sleep medicine, particularly as they relate to (a) sleep deprivation, (b) hypersomnia, (c) SRBD, (d) shift work sleep disorders, and (e) parasomnia.
- 8.1.3.4 Demonstrate appropriate attention to prevention and provide appropriate counseling during patient encounters.

8.1.4 Scholar

- 8.1.4.1 Recognize and correct knowledge deficiencies in the aforementioned sleep conditions through a personal continuing education strategy.
- 8.1.4.2 Demonstrate knowledge of how to access printed and electronic resources in sleep medicine.
- 8.1.4.3 Critically appraise medical literature as it pertains to managing patients with sleep disorders.
- 8.1.4.4 Demonstrate a basic understanding of current research priorities and methodologies in sleep medicine and how these apply to the critical reading of the medical literature.
- 8.1.4.5 Participate in clinically oriented research or a quality assurance project and receive formal feedback on this.
- 8.1.4.6 Understand the basics of research methodologies and study designs and data collections and analyses.

8.1.5 Professional

- 8.1.5.1 Demonstrate knowledge of bioethical principles when dealing with patients and their families.
- 8.1.5.2 Model appropriate personal and professional behavior during interactions with patients and colleagues.
- 8.1.5.3 Respond appropriately according to bioethical principles when dealing with patients and their families.

8.1.6 Collaborator

- 8.1.6.1 Work effectively in a team environment with attending, junior, and nursing staff.
- 8.1.6.2 Participate in the multidisciplinary team management of sleep patients.
- 8.1.6.3 Recognize the roles of the following team members:
 - a. Sleep health educator
 - b. Sleep technician
 - c. Pulmonary function technologist
 - d. Respiratory therapist dealing with CPAP clinic

8.1.7 LEADER

- 8.1.7.1 Utilize healthcare resources effectively and efficiently, demonstrating an awareness of the most cost-effective way of managing patients.

IX. CONTINUUM OF LEARNING

9.1 Program Durations

The program will have two tracks:

1. **Track 1:** A 1-year program for applicants coming from adult pulmonary medicine and adult critical care medicine
2. **Track 2:** A 2-year program for applicants coming from other medical specialties. The first year will be introductory (as detailed below), and the second year will focus on sleep medicine.

9.2 Program Structure and Rotations

9.2.1 Track 1

This year will be spent mainly at the Sleep Disorders Center, attending different clinical activities. However, time will be allocated to emphasize the following points in the specified times: *(For the summaries of required rotations for each year, see **Appendix 3**):*

A) The first six months of sleep medicine training will take place during the 1-year Sleep Medicine Fellowship Program as follows:

Month 1	☐ Orientation ☐ Introduction to the sleep laboratory procedures and policies ☐ Introduction to polysomnogram interpretation
	☐ Introduction to polysomnogram scoring ☐ Sleep-focused history and physical examination ☐ Differential diagnosis of hypersomnia, insomnia, and parasomnia ☐ Sleep medicine clinics (2–3 clinics/week with mentoring) ☐ Understanding commonly used questionnaires in the Sleep Disorders Center
Month 2	• Introduction to management and entry of patients' clinical data in the Sleep Disorders Center • The Fellow will spend time with the Sleep Disorders Center staff to learn about the following: ➢ Data collection ➢ Data management and cleaning ➢ Computer skills needed for data entry (spreadsheets) ➢ Basics of data analysis and basic statistics for the Sleep Disorders Center
Month 3	• The emphasis during this month will be on sleep disorders related to cardio-pulmonary disorders.

Month 4

- **Neuroscience, Clinical Neurology, and EEG Interpretation**
 - In addition to the work in the Sleep Disorders Center, attend one session (half-day) of advanced EEG scoring and troubleshooting of EEG signal per week in the Sleep Disorders Center
 - Attend one neurology clinic per week to gain familiarity with common neurological disorders and be trained on reading EEG for patients with nocturnal epilepsy in their training center or an outside center

Month 5

- **Otolaryngology, Dental Appliances**
 - In addition to the work in the Sleep Disorders Center, to attend one ENT clinic weekly for two weeks (with an ENT doctor interested in upper airway surgery)
 - Attend one orthodontic clinic weekly for two weeks (with an orthodontist with interest in dental appliances and dental surgery for OSA) (optional)

Month 6

- **Psychiatry, Psychology Clinics**
 - In addition to the work in the Sleep Disorders Center, attend one psychiatry clinic weekly to become familiar with the diagnosis and management of common psychiatric disorders
 - Attend one behavioral sleep medicine clinic weekly (optional)
-

B) The second six months of sleep medicine training will take place during the 1-year Sleep Medicine Fellowship Program as follows:

- **Four months** of sleep medicine training will primarily be spent in advanced clinical sleep medicine, running a sleep medicine clinic under supervision, and at least four clinics of pediatric sleep medicine.
.....
- **One-month elective:** Suggestions include two weeks in the Epilepsy Monitoring Unit and two weeks in cognitive behavioral therapy for insomnia; however, other local or international rotations can be arranged.
.....
- **Four weeks of vacation:** The Fellow is entitled to one 1-month vacation and 1-week Eid holiday per year of training. Education leaves of not more than one week/year are arranged internally within the rotations. Educational leave should be in sleep medicine and approved by the program director and service head. The Fellow must provide a certificate of attendance, or it will result in subtracting these days from their regular vacations.
.....
.....

9.2.2 Track 2

This track comprises a two-year training program for medical doctors from internal medicine, family medicine, psychiatry, neurology, and ENT.

The first year will be mainly spent in medical specialties related to sleep medicine to develop good practical knowledge in applied physiology and the clinical skills needed to deal with patients with sleep disorders, focusing on pulmonary medicine and noninvasive ventilation. The second year will be spent in the Sleep Disorders Center.

- I) **The First Year:** This year will be spent in medical specialties related to sleep medicine to develop good practical knowledge in applied physiology and the clinical skills needed to deal with patients with sleep disorders, focusing on pulmonary medicine and noninvasive ventilation.

- **One month (1st month):** Orientation

Objectives of the orientation month:

1. To gain an orientation to the setting and workflow in the sleep disorders facilities
 2. To read the necessary information on sleep disorders and their relation to subsequent rotations in the first year of training
-

- **Two months** of adult pulmonary medicine consultation
- **Two months** of adult pulmonary medicine inpatient service and outpatient clinics

Objectives of the pulmonary medicine rotations are as follows:

1. Recognize and correct knowledge deficiencies of respiratory physiology, primarily concentrating on the mechanisms of breathing, lung mechanics, and arterial blood gas interpretation.
 2. Recognize indications, contraindications, modes, and application of noninvasive ventilation and address patients' concerns and complaints about it.
 3. Demonstrate diagnostic and therapeutic skills for the assessment and management of common airway diseases, such as asthma, COPD, neuromuscular disorders, and hypoventilation, an overview of pulmonary hypertension and its types, the approach to the diagnosis and management of respiratory failure, and the effects of drugs on the respiratory system.
-

- **One month:** Respiratory therapy service and pulmonary function laboratory

Objectives of this rotation are as follows:

1. Participate in multidisciplinary team management of respirology patients. The Fellow will work with respiratory therapists (RTs) to become familiar with indications, initiation, troubleshooting, and termination of noninvasive ventilation in the inpatient service.
 2. Interpret a preliminary interpretation of pulmonary function tests with the supervisor assigned to the service.
 3. Identify abnormalities related to spirometry.
-

Note: To ensure adherence to the objectives and regular attendance of the clinical sessions with the RTs, the Fellow needs to present the cases managed and procedures attended at the end of each week of this rotation to their supervisor in the Sleep Disorders Center.

➤ **One month** in psychiatry (outpatient clinics and consultations)

Objectives of the rotation are as follows:

1. Demonstrate an appropriate clinical approach to assessing psychiatric disorders and know when to seek consultation from the psychiatry service in patients with sleep disorders.
 2. Demonstrate how to approach a patient with insomnia and comorbid psychiatric illnesses and use different interventions (pharmacological and behavioral therapy).
 3. Demonstrate knowledge of the basics of cognitive behavioral therapy for insomnia besides indications and methods of using cognitive behavioral techniques.
 4. Recognize and learn about the coexistence of sleep disorders/issues with psychiatric disorders and vice versa, and their influence on each other (e.g., insomnia and depression).
 5. Know the medications for psychiatric disorders and their effect on sleep and sleep disorders.
-

Note: Sleep medicine fellows from a psychiatry background, instead of a psychiatry rotation, may elect to perform a neurology rotation or add the month to the introduction of the Sleep Disorders Center rotation at the end of the first year.

➤ **One month** in neurology outpatient clinics and consultations

Objectives of the rotation are as follows:

1. Understand the clinical approach to history taking and physical examination of patients with neurological disorders.
2. Recognize common sleep manifestations of neurological disorders such as Parkinson's disease, Alzheimer's disease, and neuromuscular disorders.
3. Recognize the effect of medications used for seizure and other neurological disorders on sleep.
4. Gain exposure to the basics of EEG and EMG monitoring and interpretations.

Note: Sleep medicine fellows from a neurology background, instead of the neurology rotation, may elect to do a psychiatry rotation or add the month to the introduction of the Sleep Disorders Center rotation at the end of the first year.

➤ **One month** Elective

The Fellow can choose any elective in arrangement with the program director.

➤ **The last two months:** Introduction to the Sleep Disorders Center

- Introduction to the sleep laboratory procedures and policies
- Introduction to polysomnogram interpretation
- Introduction to polysomnogram scoring
- Sleep-focused history, commonly used sleep disorder questionnaires, sleep diary, and physical examination

-
- **Four weeks of vacation:** The Fellow is entitled to one 1-month vacation and a 1-week Eid holiday per year of training. Education leaves of not more than one week/year are arranged internally within the rotations. Educational leave should be in sleep medicine and approved by the program director and service head. The Fellow must provide a certificate of attendance, or it will result in subtracting these days from their regular vacations.

Note: During pulmonology OPD, neurology, and psychiatry rotations, the Fellow will attend at least two clinics per week and the unit's academic activities to which they are assigned.

- II) **The Second Year:** This year will be spent mainly in the Sleep Disorders Center, attending different clinical activities. Time will be assigned to emphasize the following points in the specified times:

- A) **The first six months** of sleep medicine training will take place during the 1-year Sleep Medicine Fellowship Program as follows:

Month 1

- **Introduction to Sleep Disorders and Managing Digital Clinical data**
 - Introduction to management and entry of patients' clinical data in the Sleep Disorders Center
 - Sleep medicine clinics (2–3 clinics/week with mentoring)
 - Differential diagnosis of hypersomnia, parasomnia, and insomnia

.....

Month 2

- **Introduction to Sleep Medicine Research:** The Fellow will spend time with the Sleep Disorders Center staff to learn about the following:
 - Data collection
 - Data management and cleaning
 - Computer skills needed for data entry (spreadsheets)
 - Basics of data analysis and basic statistics for the Sleep Disorders Center

.....

Month 3

- **Cardio-Pulmonary-Related Sleep Disorders**
 - The emphasis during this month will be on sleep disorders related to cardio-pulmonary disorders

Month 4

- **Neuroscience, Clinical Neurology, and EEG Interpretation**

- In addition to the work in the Sleep Disorders Center, attend one session (half-day) of advanced EEG scoring and troubleshooting of EEG signals per week in the Sleep Disorders Center
- Attend one neurology clinic per week to familiarize the Fellow with common neurological disorders and be trained on reading the EEG of patients with nocturnal epilepsy in their training center or an outside center

• Month 5

- **Otolaryngology, Dental Appliances**

- In addition to the work in the Sleep Disorders Center, attend one ENT clinic weekly for two weeks (with an ENT doctor interested in upper airway surgery)
- Attend one orthodontic clinic weekly for two weeks (with an orthodontist with interest in dental appliances and dental surgery for OSA) (optional)

• Month 6

- **Psychiatry, Psychology Clinics**

- In addition to the work in the Sleep Disorders Center, attend one psychiatry clinic weekly to become familiar with the diagnosis and management of common psychiatric disorders
- Attend one clinic weekly in behavioral sleep medicine clinic (optional)

B) The second six months of sleep medicine training will take place during the 1-year Sleep Medicine Fellowship Program as follows:

- **Four months** of sleep medicine training primarily spent in advanced clinical sleep medicine, running a sleep medicine clinic under supervision, and at least four clinics of pediatric sleep medicine.
- **One-month elective:** One month elective: Suggestions include two weeks in the Epilepsy Monitoring Unit and two weeks in cognitive behavioral therapy for insomnia; however, other local or international rotations can be arranged.
- **Four weeks of vacation:** The Fellow is entitled to four weeks of vacation and a one-week Eid holiday per year of training. Education leaves of not more than one week/year are arranged internally within the rotations. Educational leave should be in sleep medicine and approved by the program director and service head. The Fellow must provide a certificate of attendance, or it will result in subtracting these days from their regular vacations.

9.3 Responsibilities of the Fellow

Regardless of the preceding training and competency levels, fellows are not deemed fit to work or act as independent practitioners or specialists. They pursue their training objectives toward independence in a graded manner, providing health care services under their assigned clinical teachers' appropriate supervision. The program's final goal is to bring all trainees to the point where they can act independently and demonstrate special competence in sleep medicine.

The following highlight the responsibilities of the fellows:

a. Outpatient Service

- Sleep medicine is an outpatient service.
- The Fellow participates in outpatient services holistically, from the evaluation to the management of all aspects of sleep disorders, and during the exercise, interacts with physicians and nursing and respiratory therapy staff.
- The Fellow should attend at least one weekly sleep clinic (preferably 2–3 clinics per week).
- Their assigned work and responsibilities during the outpatient clinic are to see patients, old and new, to take the history, perform a physical examination, review the appropriate investigations, and put forward a management plan to be reviewed and approved by the consultant somnologist.
- They will continue to follow up with patients seen in subsequent visits to the clinic under the consultant's supervision.

b. Duty Hours

The definition of "duty hours" includes all clinical and academic activities related to the Fellowship Program—patient care, administrative duties related to patient care, the provision for transfer of patient care, time spent in-house during activities, and scheduled academic activities, such as conferences and educational presentations. "Duty hours" do not include time spent away from the duty site for reading and preparation.

1. "Duty hours" are limited to 80 hours per week, to be averaged over four weeks, and it is inclusive of time spent in the SDC at night.
2. The fellows are provided with one day every seven days free from all educational and clinical responsibilities, averaged over four weeks, inclusive of on-call; one day is defined as one continuous 24-hour period.
3. Adequate time to rest and engage in personal activities is provided; this consists of a minimum 10-hour period (with justification) or a mandatory 8-hour period, provided between all daily duty periods and after in-house calls.

c. On-Call Activities

There are no in-house calls during a sleep medicine fellowship. The at-home call schedule is as follows:

1. On the night before the scheduled morning study reads, the Fellow will take phone calls from the sleep laboratory technicians for patient care, strategies, and management.
2. Continuous on-site duties, including in-house calls, will not exceed 12 consecutive hours during a sleep medicine fellowship.
3. An at-home call (pager call) is defined as a call taken from outside the hospital/sleep center.
4. The frequency of at-home call is not subject to the every-third-night limitation; however, the "at-home call" must not be so frequent to preclude rest and reasonable personal time for each Fellow. Fellows taking at-home calls are provided with one day in every seven completely free from all educational and clinical responsibilities, averaged over four weeks.
5. Whenever Fellows are called to the hospital/sleep center from home, the hours that Fellows spend in-house are counted toward the 80-hour limit.

X) TEACHING METHODS

The teaching process in postgraduate fellowship training programs is based mainly on the principles of adult learning theory. The trainees shall feel the importance of learning and playing active roles in the content and the learning process. The training programs shall implement the adult learning concept in each feature of the activities where the fellows are responsible for their learning requirements. Formal training time includes the following three formal teaching activities:

- Program-Specific Learning Activities
- Universal Topics
- General Learning Opportunities

10.1 Program-Specific Learning Activities

A) Program Academic Half-Day Activity (Appendix 6):

At least 2–4 hours of formal training time per week (commonly referred to as academic half-day). Formal teaching time is an activity that is planned in advance with an assigned tutor, time slots, and venue. Formal teaching time excludes bedside teaching, clinic postings, etc. The academic half-day covers the core specialty topics determined and approved by the specialty's scientific council aligned with specialty-defined competencies and teaching methods. The core specialty topics will ensure that important clinical problems of the specialty are adequately taught. It is recommended that lectures be conducted in an interactive, case-based discussion format. Each core topic's learning objectives need to be clearly defined, and it is preferable to use a pre-learning material. The educator should ensure that each topic's discussion is stratified into three categories of the learning domain: knowledge, skill, and attitude.

The recommended number of "academic half days" conducted annually is 40 sessions per training academic year.

The conferences occur weekly (Wed afternoon) for the entire year. It is recommended that a joint national half-day be performed via Zoom. They typically comprise the following:

- A theoretical lecture according to the attached program (1 h) (**Appendix 4**)
- A case discussion (1 h) to be presented by one of the fellows and discussed by the consultant
- PSG scoring/troubleshooting alternating with a journal club (one week PSG scoring and one week journal club)

The conference is an interactive conference where both sleep faculty and fellows present interesting cases and polysomnography findings/journal club.

The topics covered in the half-day academic activities are presented in Appendix 6.

B) Logbook (Appendix 5)

The candidate will complete the requirements in the logbook, including the following:

- a. Interpret polysomnograms (PSG). This program requires a minimum of 100 PSG interpretations for sleep medicine fellowship completion, although there is ample opportunity for more.
- b. Interpret MSLT (minimum 10 for the fellowship).
- c. A minimum of 100 new patients and 150 follow-up patients must be documented in the Fellow's logbook throughout the sleep fellowship. At least 50 new patients must include a diagnosis other than sleep-disordered breathing. Evaluation of at least 20 pediatric patients is also required.

C) Inter-Scorer Reliability (ISR) (26)

Purpose: Regular assessment of scoring skills for all scoring criteria among fellows assures the consistency of scoring following the latest version of the *AASM Scoring Manual* (27).

The AASM Accreditation Standards are the “gold standard” criteria for scoring sleep studies, which are accepted internationally. A new evaluation exercise was conducted every month.

Procedure:

1. Each scorer logs into the AASM-ISR online program and scores the assigned selected epochs using the criteria written in the latest version of the *AASM Scoring Manual* (26).
2. The facility director (program director) reviews reports to determine whether scorers meet an acceptable level of scoring accuracy.

When a Fellow fails to score above the acceptable level, they must attend or discuss with the facility director (program director) to improve their performance. The supervisor/facility director guides them to overcome the problem by

- 1 Training the Fellow through a fundamental and advanced polysomnography workshop
- 2 Giving the Fellow additional reading material and educational sessions to improve their performance, including the latest version of the *AASM Scoring Manual* explaining further the AASM ISR Record Review Video, scoring studies with the assistance of the supervisor, and educational assistance from the facility director/technologists.

10.2 Universal Topics

Universal topics are educational activities developed by the SCFHS and are intended for all specialties. Priority will be given to the following types of topics:

- High value
- Interdisciplinary and integrated
- Those that require expertise that might be beyond the availability of local clinical training sites

Universal topics have been developed by the SCFHS and are available as e-learning via personalized access for each trainee (to access online modules). Each universal topic will have a self-assessment at the end of the module. As indicated in the Executive Policies of Continuous Assessment and Annual Promotion, universal topics are a mandatory component of the criteria for the annual promotion of trainees from their current training level to the subsequent level. Universal topics will be distributed over the entire training period and shall include the following:

1. Safe drug prescribing
2. Comorbidities of obesity
3. Abnormal ECG
4. Management of acute breathlessness
5. Chronic pain management
6. Ethics and Healthcare

10.3 General Learning Opportunities

The Fellow is expected to be fully involved in the activities of the sleep division, including the following:

- Journal club, which is held every month
- Involvement in quality improvement committees and meeting every six months
- Continuous professional activities (CPD) relevant to the specialty (conferences and workshops), three times/week:
 - Two presentations to be presented by the Fellow discussing topics related to curriculum, journal club, and case presentation
 - One presentation about a technical issue related to sleep studies

XI) RESEARCH

Fellows are encouraged to participate in at least one clinical research project during their training; however, publication of the research is not mandatory to complete their training fellowship.

XII) ASSESSMENT: ASSESSMENT OF LEARNING

12.1 Purpose of Assessment

Assessment plays a vital role in achieving successful postgraduate training; it guides trainees and trainers to achieve the targeted learning objectives through reciprocal feedback. Moreover, it is a reliable and valid tool that can provide an excellent means of training improvement. It can provide information on the following aspects: curriculum development, teaching methods, and the quality of the learning environment.

For organizational purposes, an assessment will be classified into two main categories: formative and summative.

Throughout the training period, the Fellow's performance will be assessed promptly to ensure that the program's aims and objectives are achieved. The assessment will be conducted during training rotations throughout the academic year as a "continuous assessment protocol/process" informative and summative evaluation.

12.2 Formative Assessment (Appendix 7)

As adult learners, fellows should ensure feedback throughout their competency journey from "a novice" to "a master" of the specialty.

Formative assessment is an assessment component that is distributed throughout the academic year. The primary aim of the Formative Evaluation is to provide trainees with healthy and helpful feedback. The annual summation of the overall productive assessment tools will be utilized at the end of each year to determine whether individual trainees will be promoted to the next level of training.

Formative assessment is defined as per the scientific committee recommendations (usually updated and announced for each program at the beginning of the academic year). According to the Executive Policy (available online: www.scfhs.org), continuous and formative assessments must have the following features:

- a. Multisource: minimum of four assessment tools
- b. Comprehensive: covering all learning domains (knowledge, skills, and attitude)
- c. Relevant: focusing on workplace-based observations
- d. Competency-milestone oriented: reflecting trainees' expected competencies that match their respective developmental levels.

Trainees should play an active role in seeking feedback during training from their trainers. Accordingly, trainers are expected to provide timely, formative assessments. The SCFHS provides an e-portfolio system to facilitate communication and data analysis during formative assessment.

12.2.1 Formative Assessment Tools

The following formative assessment tools will be applied:

- Logbook
 - Direct observation of practical skills (DOPS)

Continuous assessment formats consist of the following:

a. In-Training Evaluation Reports (ITER)

ITERS should be conducted at least three times, covering nine (9) training months per year. They are submitted to the local supervisory committee for each trainee and are based on a series of workplace-based assessments (WBA) considered relevant to the specialty.

b. Other Assessment Formats

- Research activities
- International examinations

c. Final In-Training Evaluation Report (FITER)

In addition to approval of the completion of clinical requirements (the Fellow's logbook) by the supervising committee, FITER is also prepared by program directors for each resident at the end of their final year of training. This report shall be the basis for obtaining the Training Program Completion certificate and the qualification to sit for the Final Specialty Exams.

According to the executive policy of continuous assessment, trainees must earn a specified minimum grade (borderline-pass) in every component of the continuous assessment tools to be qualified for promotion. For further details, please refer to the policy indicated on the SCFHS website. See **Appendix 7** for more information on the chosen formative tools and the frequency required.

12.2.2 Summative Assessment Tools

12.2.2.1 The general objective of summative assessment is to make informed decisions on trainees' competencies. Unlike formative assessments, it does not seek to provide constructive feedback. Please refer to the general bylaws and executive policy of review (available online: www.scfhs.org). To be eligible to sit for the final exam, a trainee should be granted the Certification of Training Completion.

12.2.2.2 Certification of training completion to be eligible to sit for the final specialty examinations: Each trainee is required to obtain the Certification of Training Completion. Based on the training bylaws and executive policy (please refer to), trainees will be granted the Certification of Training Completion upon successful completion of all training rotations.

12.2.2.3 Final Specialty Examinations

- A. **Final Written Exam:** This is a written examination consisting of multiple-choice questions (MCQs); it is conducted annually at the end of each academic year. The number of exam items, eligibility, and passing scores will be determined according to the Commission's training and examination rules and regulations. **Appendix 8** presents the written examination blueprint.
- B. **Final Clinical Exam:** This examination assesses trainees' level of clinical skills and approach in management, including data gathering, patient management, communication, and counseling skills. It is held annually at the end of each academic year and will be in either the SOE or OSCE format in the form of PMPs. Exam eligibility and passing scores will be in accordance with the Commission's training and examination rules and regulations. **Appendix 9** presents the clinical (practical) examination blueprint.

Miller's Pyramid of Assessment provides a framework for assessing the trainees' clinical competences, which acts as a road map for the trainers to select the assessment methods to target different clinical competencies, including "knows," "knows how," "shows how," and "does" (**Appendix 10**).

Note: Two important points related to the examinations are as follows: 1) A candidate must pass the written exam at the end of the first year (the passing mark is 60%) to be allowed to move to the second year of training. 2) A candidate must obtain a letter from their program director stating that their performance during the end of the training period is satisfactory to be eligible for the final examination.

Note: Upon completing all the requirements and passing all exams, the candidate will be awarded The Saudi Specialty Degree in Sleep Medicine Certificate according to the rules and regulations of the SCFHS. The name of the fellowship is "SF-SM" (Saudi Fellowship in Sleep Medicine).

XIII) PROGRAM AND COURSES EVALUATION

The SCFHS applies variable measures to evaluate the implementation of this curriculum. The training outcomes of this program will undergo the quality assurance framework endorsed by the Central Training Committee at the SCFHS. Trainees' assessment (both formative and summative) results will be analyzed and mapped to curriculum content.

Other indicators that will be incorporated are as follows:

- Reports on the annual trainees' satisfaction survey
- Reports from trainees' evaluation of faculty members
- Reports from trainees' evaluation of rotations
- Reports from the annual survey of program directors
- Data available from program accreditations
- Reports from direct field communications with trainees and trainers

Goal-Based Evaluation: The intended achievement of milestones will be evaluated at the end of each stage to assess the curriculum delivery progress, and any deficiency will be addressed in the following stage utilizing the time devoted to trainee-selected topics and professional sessions.

In addition to subject-matter opinion and best practices from benchmarked international programs, the SCFHS will apply a robust method to ensure that this curriculum will utilize all the data available during the revision of this curriculum in the future.

XIV) POLICIES AND PROCEDUR

This curriculum represents the means and materials that outline the learning objectives with which trainees and trainers will interact to achieve the identified educational outcomes.

The SCFHS has a full set of General Bylaws and Executive Policies (published on the official SCFHS website) that regulate all training-related processes. The general bylaws of training, assessment, accreditation, and executive policies on admission, registration, continuous assessment and promotion, examination, trainees' representation and support, duty hours, and leaves are examples of regulations that need to be followed.

Under this curriculum, trainees, trainers, and supervisors must comply with the most up-to-date bylaws and policies, which can be accessed online (via the official SCFHS website).

XV) APPENDICES

Appendix 1: Competency Roles Related to Each Professional Activity

**Appendix 2: The Medical and Scientific Topics to be Covered during the Fellowship Training;
Curriculum Topics – Specific Program Content Outline**

Appendix 3: Required Rotations for Each Year

Appendix 4: Lectures Program for Sleep Medicine Fellows

Appendix 5: Logbook Example

Appendix 6: Half-Day Activity Table

Appendix 7: Formative Assessment Tools

Appendix 8: Written Blueprint

Appendix 9: Practical Blueprint

Appendix 10: Miller's Pyramid of Assessment

Appendix 1: Competency Roles Related to Each Professional Activity

Competency Roles (with annotation of learning domains involved: K: knowledge, S: Skills, A: Attitude)	Professional Activities Related to Specialty				
	Conducting a full patient clinical assessment	Show the understanding of sleep physiology & chronobiological characteristics of sleep	Managing patient undergoing diagnostic procedures and assessment of sleep disorders	Managing patient with sleep disorders	Compliance with documentation and proper reporting standards
Professional Expert	Mastering history taking and physical examination K, S	• A. Physiology of sleep: □ Sleep and wakefulness physiology and its relation to age □ The control of sleep □ The proposed biological functions of sleep □ EEG signals during wakefulness, sleep, and different sleep stages • Familiarity with the latest AASM scoring criteria of sleep stages □ What happens to body functions during sleep □ Brain activity □ The control of the activities of skeletal muscles □ Sensations	• Ability to perform clinical and psychological workup (interview and examination) • Adequate knowledge of diagnostic approach to diseases listed in ICSD-3 (2014) • Mastering various sleep disorders diagnostic procedures, including the following: ➢ PSG (Type-I sleep studies) ➢ The utility of daytime PSG ➢ Cardiorespiratory polygraphy ➢ MSLT and MWT ➢ Sleep/wake questionnaires ➢ Basic knowledge of other diagnostic tests related to sleep disorders (e.g., neuropsychological tests) K, S	• Positive airway pressure therapy and its different modes • Strategies to enhance PAP adherence • Telemonitoring of PAP therapy • The interpretation of the PAP stored data • Cognitive behavioral therapy and other psychotherapeutic procedures • Sleep hygiene; light therapy • The influence of medication on sleep • Drug therapy for sleep disorders • Surgical procedures for sleep-disordered breathing; indications and side effects • Dental appliances for OSA K, S	Relevant documentation of daily patient care, prescriptions, K, S, A

		☐ Autonomic nervous system activity ☐ Cardiovascular functions ☐ Breathing and respiratory functions ☐ Metabolism ☐ Hormonal activities and secretion; circadian rhythm-related hormones vs. sleep-related hormones ☐ Changes in core internal temperature (thermoregulation) ☐ Health consequences of acute and chronic sleep deprivation ☐ The proposed functions of NREM and REM sleep stages B. Chronobiological characteristics of sleep: ☐ Central and peripheral circadian clocks, their interactions, and their influence on circadian rhythms, such as temperature and hormones, and their relation to cardiometabolic changes			
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		☐ Chronobiological models of sleep regulation ☐ Methods for assessing time-dependent variations of sleepiness and alertness ☐ Circadian rhythm disorders (diagnosis and management) K, S			
Communicator	Effectively communicating with patients and guardians K, S, A		Informed consent K, S	Effectively communicating with a patient, guardian, or team member K, S, A	Writing, consultation, and presentation skills K, S
Collaborator			Multidisciplinary, teamwork S, A	Seek support from senior physicians when needed K, S, A	Interprofessional communication A
Advocate	Holistic approach and preventive medicine K, S, A		Patient safety K, S, A	Patient safety K, S, A	Quality improvement K, S, A
Leader	Time management S				
Scholar		Evidence-based practice K, S	Evidence-based practice K, S	Evidence-based practice K, S	
Professional			Interprofessional relation A	Confidentiality, interprofessional relation A	Interprofessional relation A

Appendix 2: The Medical and Scientific Topics to be Covered during the Fellowship Training; Curriculum Topics – Specific Program Content Outline*

I. Basic Science

The curriculum will cover aspects of basic sciences relevant to sleep and sleep disorders, with emphasis on material from the following disciplines and topics:

- A. Neuroanatomy and neurophysiology
- B. Circadian neuroanatomy, neurophysiology, neurochemistry, genetics, behavior
- C. Electrophysiology
- D. Endocrinology relevant to sleep
- E. Motor and muscle control during sleep
- F. Respiratory physiology relevant to sleep
- G. Physiology of ANS relevant to sleep
- H. Cardiovascular physiology relevant to sleep
- I. Immunology relevant to sleep
- J. Polysomnographic description of normal human sleep
 - 1. The stages of sleep
 - 2. Characteristics of REM and NREM sleep
 - 3. Normal sleep pattern in adults
 - 4. Sleep patterns across the lifespan
- K. Dream content and physiology
- L. Neuropharmacology of sleep
 - 1. Acetyl cholinergic
 - 2. Adrenergic
 - 3. Dopaminergic
 - 4. Serotonergic
 - 5. Histaminergic
 - 6. GABAergic
 - 7. Adenosinergic
 - 8. Orexinergic
 - 9. Peptides
 - 10. Neuromodulators
 - 11. Other
- M. Effects of sleep deprivation and sleep fragmentation
- N. Molecular biology relevant to sleep
- O. Neuroimaging studies of sleep

II. Applied Technology

- A. Electronics and instrumentation
- B. EEG, EMG, and EOG basics
- C. Polysomnographic recording technique
- D. Polysomnographic scoring techniques
 - 1. Sleep micro-architecture
 - 2. Sleep macro-architecture (staging)
 - 3. Sleep respiratory event scoring
 - 4. Sleep movement event scoring
 - 5. REM atonia level scoring
 - 6. Abnormal EEG event detection and recognition
 - 7. Sleep cardiac event recognition
 - 8. Polysomnographic artifact recognition
 - 9. Polysomnographic video classification techniques

- E. Positive airway pressure and titration
 - 1. Mask types and fitting
 - 2. Machine types
 - 3. Patient education
 - 4. Assessing titration adequacy
 - 5. Assessing acceptance and utilization
- F. Autotitration techniques
- G. Oxygen administration
- H. Summarizing the polysomnogram
- I. Recording, scoring, and summarizing home sleep testing
- J. Conducting and summarizing an MSLT
- K. Conducting and summarizing a maintenance of wakefulness test
- L. Conducting and summarizing a suggested immobilization test
- M. Conducting and summarizing a full REM atonia test for REM behavior disorder
- N. Recording and summarizing actigraphy
- O. Advanced signal processing and analysis techniques

III. Sleep Medicine

- A. History
- B. Classification systems for sleep disorders
 - 1. International Classification of Sleep Disorders (ICSD)
 - 2. International Classification of Diseases (ICD9, ICD10)
 - 3. Diagnostic and Statistical Manual of the Mental Disorders
- C. Sleep-related breathing disorders
 - 1. Central sleep apnea syndromes
 - 2. OSA syndromes
 - 3. Sleep-related hypoventilation/hypoxemic syndromes
 - 4. Sleep-related hypoventilation/hypoxemia due to medical conditions
 - 5. Other sleep-related breathing disorders
- D. Hypersomnias of central origin
 - 1. Narcolepsy
 - 2. Recurrent hypersomnia idiopathic hypersomnia
 - 3. Behaviorally induced insufficient sleep syndrome
 - 4. Hypersomnia due to medical condition
 - 5. Hypersomnia due to drug or substance use
 - 6. Other hypersomnias

E. Insomnias

1. Adjustment insomnia
2. Psychophysiological insomnia
3. Paradoxical insomnia
4. Idiopathic insomnia
5. Insomnia associated with mental disorder
6. Inadequate sleep hygiene
7. Behavioral insomnia of childhood
8. Insomnia due to drug or substance
9. Insomnia due to medical condition
10. Other insomnia classifications

F. Sleep-related movement disorders

1. Periodic limb movement disorder
2. Restless legs syndrome (Willis-Ekbom disease)
3. Sleep-related leg cramps
4. Rhythmic movement disorders in sleep
5. Sleep bruxism

G. Parasomnias

1. NREM parasomnias: Confusional awakenings, sleep walking, and sleep terrors
2. REM parasomnias: Nightmares, sleep paralysis, REM behavior disorder
3. Other parasomnias: Sleep-related dissociative disorders, sleep enuresis, sleep-related groaning, exploding head syndrome, sleep-related hallucinations, sleep-related eating disorder, and others.

H. Circadian rhythm disorders

1. Delayed sleep phase disorder
2. Advanced sleep phase disorder
3. Irregular sleep-wake rhythm
4. Non-entrained sleep-wake rhythm
5. Jet lag disorder
6. Shift work disorder
7. Circadian disorder due to medical condition
8. Circadian disorder due to drug or substance
9. Other circadian disorders

I. Sleep and psychiatric disorders

J. Sleep and neurological disorders

K. Sleep and medical disorders

L. Epidemiology of sleep disorders

M. Sleep disorders and public safety

N. Current standards of practice

O. Cognitive behavioral therapy for insomnia

P. Clinical pharmacology of sleep

1. Pharmacokinetics, pharmacodynamics, and drug metabolism
2. Pharmacological treatment of insomnia
3. Pharmacological treatment of sleepiness
4. Pharmacological treatment of movement disorders
5. Pharmacological treatment of parasomnia
6. Pharmacological treatment of circadian disorders

Q. Sleep medicine forensics

R. Ethical, economic, and legal aspects of sleep disorders

1. Hours of duty regulation: health care
2. Hours of duty regulation: transportation industry

IV. Sleep Disorders: Clinical and Laboratory Assessment

A. Clinical

1. Cardinal manifestations of sleep disorders
2. Conducting a clinical sleep interview
 - a) Sleep schedule: Weekday, weekend, napping, shift work
 - b) Sleepiness, tiredness or fatigue, sleep scale interpretation, sleep attacks, sleeping at the wheel
 - c) Sleep-disordered breathing: Snoring, choking or gasping, witnessed apnea, morning headaches, morning dry mouth
 - d) Narcolepsy: Cataplexy, sleep paralysis, hypnagogia
 - e) Insomnias: Initiating sleep, maintaining sleep, non-refreshing sleep, early morning awakening, crawling legs, leg kicking, rumination, fearfulness of not sleeping, pain, mood, mood scale interpretation, sleep diary assessment, structured interviews, and patient-reported measures
 - f) Movement disorders: leg kicking, difficulty sitting/lying still in the evening or night, night leg cramps, and jerking at sleep onset
 - g) Parasomnia: sleep walking, fearful awakenings (early, middle, or late in the night, with or without paralysis, dream recall or not), dream enactment (hitting, punching, injury, associated with dreaming), leg cramps, sleep talking, and other vocalizations (e.g., shouting, laughing, singing), bedwetting, leaving the bed at night (eyes open or closed)
 - h) Circadian rhythm disorders: Sleeping in the early evening, sleeping during the first part of the day, difficulty sleeping during the first part of the night, difficulty staying asleep in the early morning, difficulty staying awake in the morning
 - i) Other: GERD, nocturnal coughing, nocturnal headache
 - j) Comorbid conditions
 - k) Medication and substance use

Overall effect of the sleep problem on the level of distress, activity of daily living, and quality of life

B. Interpreting Laboratory and Home Testing Results:

1. PSG
2. MSLT
3. MWT
4. HST
5. SIT
6. Actigraphy

C. Other Testing

1. Questionnaires used to assess sleep and sleep disorders
2. Genetic testing for sleep disorders
3. Blood work (e.g., ferritin; thyroid panel)

D. Preparing a clinical sleep interpretation report

1. Background

- a) Sleep history, habits, and problems
- b) Sleep schedule
- c) Sleepiness rating
- d) Signs and symptoms
- e) Depression rating
- f) Comorbid conditions and concurrent medication

2. Polysomnographic and related results

- I. Testing performed
- II. Sleep and arousal parameters
- III. Sleep-related breathing results
- IV. Leg movement activity
- V. REM atonia results (differentiating tonic and phasic; specifying which muscles)
- VI. Abnormal cardiac activity, abnormal EEG activity, and CAP
- VII. MSLT and MWT results
- VIII. SIT results
- IX. PAP results
- X. Video analysis and comments

3. Actigraphy

4. Diagnosis

5. Treatment plan recommendations

6. Safety warnings

7. Follow-up plan

V. Safety in the Clinic and Laboratory

- A. Acute and urgent events in sleep medicine
- B. Acute and urgent events in the sleep laboratory
- C. Safety and infection control in the sleep laboratory

VI. Methodology for Sleep Research

- A. Research methods
- B. Experimental design
- C. Statistical methods

Proposed Presentation Topics

Given below are topics listed from our curriculum on sleep and its disorders. We should consider developing PowerPoint © and/or video presentations for each of these topics.

I. Basic Science

1. Sleep neurobiology: Physiology, neurophysiology, circadian rhythms

Role of the pons in the generation of REM sleep (EEG characteristics, REM atonia). Structural anatomy of wakefulness versus sleep. Physiological rhythms of the sleeping brain affecting all body systems. Functional neuroanatomy of sleep. Sleep and cognition.

2. Somnopharmacology

REM off neurotransmitters: Serotonin and norepinephrine. REM in neurotransmitters, acetylcholine. Role of the reticular nucleus of the thalamus in the generation of delta sleep and sleep spindles. Role of acetylcholine, dopamine, histamine, and orexin (hypocretin) in wakefulness. Structural anatomy of wakefulness versus sleep. Physiological rhythms of the sleeping brain affecting all body systems.

3. Sleep and endocrine physiology

4. Sleep and cardiovascular physiology

II. Technology and Techniques

- A. Recording PSG & scoring PSG
- B. Advanced scoring PSG
- C. Video polysomnography
- D. Assessing sleepiness and alertness (includes MSLT and MWT)
- E. Actigraphy
- F. Psychological and psychometric testing
- G. Fast-tracking use of cardio-pulmonary recorders and AutoPAP

III. sleep disorders

1. Nosology of sleep disorders

2. Approach to the patient with sleep problem: adult

3. Sleep-related breathing disorders:

Epidemiology; relationship to stroke, heart, inflammatory disease, diagnosis, and treatment: What clinical history suggests sleep apnea? What is an obstructive, mixed, central apnea? How do we identify them using polysomnography? What are the implications of sleep apnea for cardiovascular and cerebrovascular diseases? Improvement of excessive daytime drowsiness by treatment of sleep-disordered breathing. What is the role of CPAP, ENT surgery, and dental appliances in the treatment of sleep apnea? Cardiac arrhythmias and sleep apnea. Neuroanatomy and neurophysiology of breathing.

4. Dysomnia associated with psychiatric disorders

5. Sleep disorders associated with neurological disorders

Parkinson's disease, Huntington's disease, Dystonia, Alzheimer's Disease and "sundowning," muscular dystrophy, myotonic dystrophy, myasthenia, amyotrophic lateral sclerosis and sleep-disordered breathing. MSA subforms such as olivo-pontocerebellar atrophy, sleep-disordered breathing, SCA, neuropathies (such as CMT), and sleep-disordered breathing.

6. Sleep disorders associated with medical disorders

Asthma, gastroesophageal reflux, arthritis, congestive heart failure, ulcers, etc.

7. Chronic respiratory failure and ventilatory support, including care of the chronically ventilated patient
8. Sleep-related hypoventilation
9. Narcolepsy and hypersomnia

Epi, Genetics, Dx, and Management: What are the clinical features of narcolepsy? How is the MSLT used? How can it be used to determine whether narcolepsy is present? What is insufficient sleep syndrome, and how can it be distinguished from narcolepsy by history and polysomnography? What is idiopathic hypersomnia, and how can it be distinguished from narcolepsy? Post-traumatic hypersomnia. Drugs and toxins.

10. Insomnia Diagnosis: Epidemiology

Clinical features, etiologies, comorbidities, psychiatric, medical, neurological, medical, and pharmacological causes of sleep disruption. What is paradoxical insomnia? How does this differ from insomnia attributed to anxiety or depression? Conceptual models for insomnia (Spielman's 3Ps, neurocognitive, neurobiological, and hyperarousal).

11. Insomnia: Cognitive behavioral therapy

Including rules for good sleep hygiene. Cognitive therapy and progressive muscle relaxation autogenic training and visual-guided imagery. Hypnosis. Sleep Restriction. Stimulus control therapy. Mindfulness-based stress reduction.

12. Insomnia: Pharmacotherapy

Benzodiazepine-receptor agonists. Melatonin-R agonists. Antihistamines. Orexin antagonists. Sedating antidepressants. Atypical antipsychotics.

13. Circadian rhythm disorders

Relevant physiology of circadian rhythms. Jet lag and shift work. Delayed sleep phase syndrome. Advanced sleep phase syndrome. Non-24-hour syndrome. Irregular sleep-wake syndrome. Role of melatonin, bright light, and chronotherapy in the treatment of circadian rhythm disorders.

14. RLS (WED)

Definition, differential, workup, and management: How is RLS identified clinically, and when should a sleep evaluation be conducted? When should the suggested immobilization test be used? What are the morbidities and social costs of the RLS/WED? What is the relationship between an increased risk of cardiovascular disease and increased mortality? What is the relationship between RLS/WED and iron deficiency, end-stage renal disease, pregnancy, and multiple medical disorders? What are the genetic factors associated with RLS? What is RLS augmentation? The role of dopaminergic agents, alpha-2 delta drugs, opioids, oral iron, and IV iron in the treatment of RLS/WED?

15. PLMS and PLMD

Definition, differential, workup, and management of PLMD: What are the rules for identifying PLMS on polysomnography? What is the variation in the PLMS over time? What is the role of leg activity monitoring in assessing PLMS? How do PLMS relate to periodic limb movements during sleep? Are PLMS associated with daytime hypersomnolence? Are PLMS markers for renal, cardiovascular, and psychiatric diseases? What is the relationship between PLMS and RLS/WED, narcolepsy, and REM sleep behavior disorder? How and when is PLMD treated?

16. Parasomnias, movement disorders, and seizures

Things that go "bump in the night." REM sleep behavior disorder. Disorders of partial arousal (sleepwalking, sleep terrors, confusional arousals). How do we distinguish these factors from sleep-related epilepsy? Benign neonatal sleep myoclonus and differentiation from epilepsy. Rhythmic movement disorder (head banging and body rocking). Fatal familial insomnia (oneiric stupor, ataxia, myoclonus) and nocturnal paroxysmal dystonia. Sleep-related bruxism. Which types of epilepsy have a predilection for sleep or the time just before or after sleep? Benign Rolandic epilepsy. Juvenile myoclonic epilepsy. What are the manifestations of frontal lobe epilepsy? What is nocturnal paroxysmal dystonia? What other non-epileptic disorders are in the differential diagnosis of nocturnal wandering other than frontal lobe epilepsy?

17. Summarizing PSG and writing a clinical report

IV. Pediatric Sleep Medicine

1. Approach to the patient with sleep problem: Pediatric
2. Pediatric sleep medicine: Neonates and infants, including SIDs and related disorders
3. Pediatric sleep medicine: Toddlers, Young Children, and Adolescents, including behavioral insomnia of childhood
4. Pediatric sleep-disordered breathing
5. Pediatric parasomnias: Definition, differential, workup, and management

V. Special Topics

1. Standards of practice
2. Evidence-based medicine approach and statistics
3. Sleep and metabolic disorders
4. Dentistry and sleep
5. Case series presentations and discussions
6. Sleep disorders in women
 - IV. Sleep disorders in pregnancy
 - V. Menstrual-related sleep disorders
 - VI. Other sleep disorders in women
- a) Sleep disorders in mental retardation
- b) The history of sleep medicine
- c) Sleep at high altitude

*Adapted from World Sleep Society (28)

Appendix 3: Required rotations for each year

1st Year for Track 2 only	
<i>The First Year: This year will be spent in medical specialties related to sleep medicine to develop good practical knowledge in applied physiology and the clinical skills needed to deal with patients with sleep disorders, focusing on pulmonary medicine and noninvasive ventilation</i>	
Orientation	One month (1st month)
Adult Pulmonary Medicine Consultation	Two months
Adult Pulmonary Medicine Inpatient Service and Outpatient Clinics	Two months
Respiratory Therapy Service and Pulmonary Function Test Laboratory	One month
Psychiatry (Outpatient Clinics and Consultations)	One month
Neurology (Outpatient Clinics and Consultations)	One month
Elective	One month
Introduction into the Sleep Disorders Center	The last two months
Vacation	Four weeks
2nd Year for Track 1 and Track 2	
<i>The first six months of sleep medicine training will take place during the 1-year Sleep Medicine Fellowship Program as follows:</i>	
Introduction to Sleep Disorders and Managing Digital Clinical Data	Month 1
Introduction to Sleep Medicine Research	Month 2
Cardio-Pulmonary-Related Sleep Disorders	Month 3
Neuroscience, Clinical Neurology, and EEG Interpretation	Month 4
Otolaryngology, Dental Appliances (One ENT clinic weekly, orthodontic clinic weekly (optional*))	Month 5
Psychiatry, Psychology Clinics (In addition to the work in the Sleep Disorders Center, one psychiatry clinic, behavioral sleep medicine clinic (optional*))	Month 6
<i>The second six months of sleep medicine training will take place during the 1-year Sleep Medicine Fellowship Program as follows:</i>	
Sleep Medicine Clinics	Four months
Elective (Epilepsy monitoring, cognitive behavioral therapy, or other local or international rotations)	Month 1
Vacation	Four weeks
Sleep Medicine Clinics	Four months

*Optional: the rotation is recommended but not compulsory; if not available, the Fellow can choose from rotations they like.

Appendix 4: Lectures Program for Sleep Medicine Fellows

NO	TOPICS	DAY/TIME	DATE
PHYSIOLOGY			
1	Wake-Sleep Mechanisms		
2	Control of Breathing during Sleep		
3	Cardiovascular Physiology during Sleep		
4	Endocrine Gastrointestinal Physiology		
5	Temperature and Thermoregulation		
6	Circadian Rhythm in Humans		
PHARMACOLOGY			
7	Pharmacology of Sleep and Wakefulness (Hypnotics and Stimulants)		
PRESENTATION AND DIAGNOSIS OF SLEEP DISORDERS:			
8	Approach to Patients with Disordered Breathing		
9	Approach to Patients with Excessive Sleepiness		
10	Polysomnography		
11	Portable Monitoring		
12	MSLT and MWT		
SLEEP-DISORDERED BREATHING			
13	Anatomy and Physiology of the Upper Airway		
14	Obstructive Sleep-Disordered Breathing		
15	PAP Therapy for OSA		
16	Alternative Treatment for OSA (Surgical and Oral Appliances)		
17	Central Sleep Apnea and Cheyne-Stroke Respiration		
18	Obesity Hypoventilation Syndrome		
19	Sleep in Other Respiratory Disorders		
EXCESSIVE DAYTIME SLEEPINESS			
20	Narcolepsy		
21	Other Causes of Hypersomnia		
INSOMNIA			
22	Overview and Diagnosis of Insomnia		
23	Management: Behavioral and Pharmacological		
CIRCADIAN RHYTHM			
24	Circadian Rhythm Disorders		
NEUROLOGICAL DISORDERS:			
25	RLS and PLMs		
26	Epilepsy and Sleep		
27	Sleep in Other Neurological Disorders		
ARASOMNIAS:			
28	NREM Sleep Arousal Parasomnias		
29	REM Sleep Parasomnias		

Appendix 5: Logbook example

Name:.....	PSG
File Number:.....	
Diagnosis:.....	
Date:.....	
Signature:.....	
Name:.....	MSLT
File Number:.....	
Diagnosis:.....	
Date:.....	
Signature:.....	
Name:.....	Other Procedures
File Number:.....	
Diagnosis:.....	
Date:.....	
Signature:.....	
Name:.....	Clinical Case
File Number:.....	
Diagnosis:.....	
Date:.....	
Signature:.....	

Appendix 6: Academic Half-Day Activities Demonstration

Academic week	Section	Date	Time	Sessions	presenters
1	Sleep Physiology	Jan 5	13:00–14:00	Sleep-wake mechanism	A
			14:00–15:00	Case base study**	A
			15:00–16:00	Sleep staging scoring	B
2	Insomnia	Jan 12	13:00–14:00	Insomnia	C
			14:00–15:00	Insomnia base study	D
			15:00–16:00	Journal club	E
3	Sleep-Related Breathing Disorders	Jan 19	13:00–14:00	Obstructive sleep apnea (OSA)	F
			14:00–15:00	OSA base study	B
			15:00–16:00	Respiratory events scoring	C
4	Circadian	Jan 26	13:00–14:00	Circadian mechanisms	K
			14:00–15:00	Circadian disorders base study	B
			15:00–16:00	Journal club*	A

Appendix 7: Formative Assessment Tools

Assessment Tool	Evaluator	Timing and Frequency	Subject of Assessment
Rotation evaluation	Site program director/local program director	At the end of each rotation, collected at the end of the year and averaged	Global performance, Attitude
Direct observation of procedural skills (DOPS) ISR	Site program director	Once a month (12 sets in total); must score above 85 in 9 months to sit for the final exam	Sleep studies scoring-related skills
Logbook	Site program director	Must complete the requirement before final exam	Procedure competency; reflections
Research	Scientific committee	Oral/poster presented at annual meeting	Data collection; analysis; synthesis; research skills
Annual written promotion examination: Multiple-choice questions (MCQs)	SCFHS Examination committee	End of the academic year	Knowledge

Appendix 8: Written Exam Blueprint

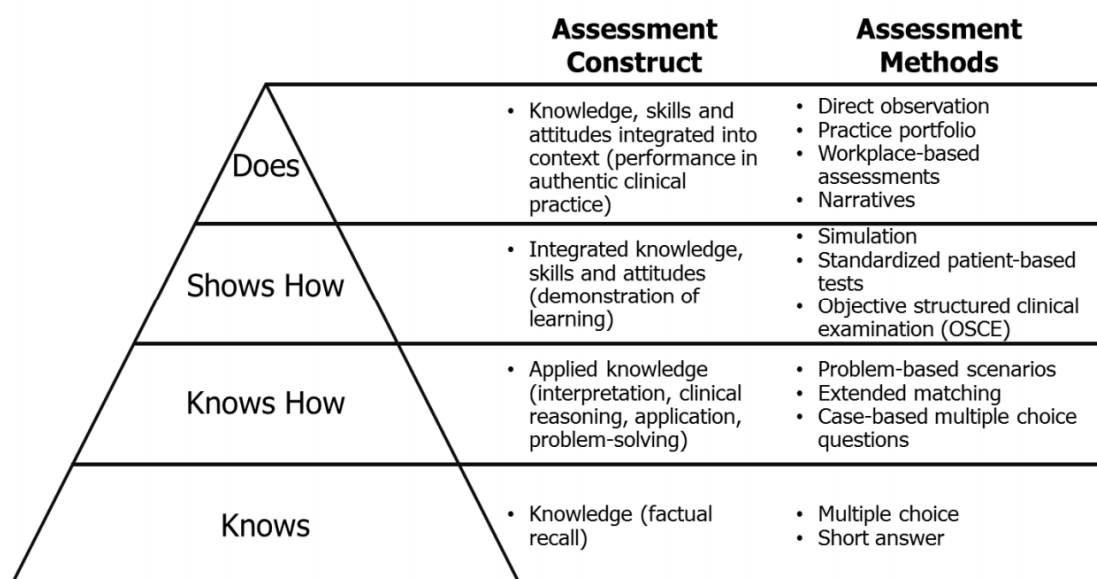
Contents						
Categories	Sections	Number of MCQs	Medical science	Diagnosis	Management	Investigations
Insomnia 8.3%	Insomnia	5	1	1	2	1
Sleep-Related Breathing Disorders 26.6 %	OSA Disorders	7	1	3	2	1
	PAP Titration	2	N/A	N/A	N/A	2
	Portable Monitoring	1	< 1	< 1	< 1	< 1
	Alternative Treatment for OSA	1	3	1	2	1
	Central Sleep Apnea and OHS	5	1	2	1	1
Normal Sleep and Variants 8.3%	Normal Sleep and Variants	5	1	1	2	1
Sleep-Wake Timing 6.6%	Sleep-Wake Timing	4	1	1	1	1
Hypersomnias 8.3%	Hypersomnias	5	1	2	1	1
Sleep-Related Movement Disorders 16.6%	Parasomnias	4	< 1	1	2	< 1
	Nocturnal Seizure	2	< 1	1	< 1	< 1
	RLS	4	< 1	2	1	< 1
Instrumentation and Testing 10%	PSG Technology	5	N/A	N/A	N/A	5
	Filter and Artifact	1	N/A	N/A	N/A	1
Sleep in Other Disorders 5%	Sleep in Lung Disease	2	< 1	1	< 1	< 1
	Neuromuscular Disease	1	< 1	< 1	< 1	< 1
Pediatric Questions 8.3%		5	< 1	2	2	< 1
Pharmacology and Sleep 1.6%	Pharmacology and Sleep	1	< 1	N/A	< 1	N/A
100%	Total	60				

Appendix 9: Practical blueprint

		DIMENSIONS OF CARE				
		Health Promotion and Illness Prevention 1±1 Station(s)	Acute 0±1 Station(s)	Chronic 5±1 Station(s)	Psychological Aspects 1±1 Station(s)	# Station(s)
DOMAINS FOR INTEGRATED CLINICAL ENCOUNTER	Patient Care 7±1 Station(s)	1		2	1	4
	Patient Safety and Procedural Skills 1±1 Station(s)			1		1
	Communication and Interpersonal Skills 2±1 Station(s)			1		1
	Professional Behaviors 0±1 Station(s)					0
	Total Stations	1	0	4	1	6

Appendix 10

Miller's Pyramid of Assessment offers an outline for assessing the trainees' clinical competences, which acts as a road map for the trainers to select the assessment methods to target different clinical competencies, including "knows," "knows how," "shows how," and "does" (2).



(Figure 1: Miller Pyramid)

- 1- Adapted from Walsh CM In-training gastrointestinal endoscopy competency assessment tools: Types of tools, validation, and impact. Best Pract Res Clin Gastroenterol 2016 Jun 1;30(3):357-74.
- 2- Miller GE. Assessment of clinical skills/competence/performance Acad Med. 1990;65(9 Suppl): S63-7.

XVI) REFERENCES

1. BaHammam AS, Aljafen B. Sleep medicine service in Saudi Arabia. A quantitative assessment. Saudi Med J. 2007;28(6):917-21.
2. BaHammam AS, Al-Rajeh MS, Al-Ibrahim FS, Arafah MA, Sharif MM. Prevalence of symptoms and risk of sleep apnea in middle-aged Saudi women in primary care. Saudi Med J. 2009;30(12):1572-6.
3. BaHammam AS, Alrajeh MS, Al-Jahdali HH, BinSaeed AA. Prevalence of symptoms and risk of sleep apnea in middle-aged Saudi males in primary care. Saudi Med J. 2008;29(3):423-6.
4. Netzer NC, Hoegel JJ, Loubé D, Netzer CM, Hay B, Alvarez-Sala R, et al. Prevalence of symptoms and risk of sleep apnea in primary care. Chest. 2003;124(4):1406-14.
5. Wali SO, Abalkhail B, Alotaibi M, Krayem A. Prevalence of sleep disordered breathing in a Saudi population. ATS 2016 2016. p. A2555.
6. BaHammam A, Al-Mobeireek A, Al-Nozha M, Al-Tahan A, Binsaeed A. Behaviour and time-course of sleep disordered breathing in patients with acute coronary syndromes. Int J Clin Pract. 2005;59(8):874-80.
7. Alotair H, BaHammam A. Gender differences in Saudi patients with obstructive sleep apnea. Sleep Breath. 2008;12:323-9.
8. BaHammam AS, Alrajeh MS, Al-Ibrahim FS, Arafah MA, Sharif MM. Prevalence of symptoms and risk of sleep apnea in middle-aged Saudi women in primary care. Saudi Med J. 2009;30(12):1572-6.
9. BaHammam AS. Prevalence, clinical characteristics, and predictors of obesity hypoventilation syndrome in a large sample of Saudi patients with obstructive sleep apnea. Saudi Med J. 2015;36(2):181-9.
10. BaHammam AS, Alenezi AM. Narcolepsy in Saudi Arabia. Demographic and clinical perspective of an under-recognized disorder. Saudi Med J. 2006;27(9):1352-7.
11. al Rajeh S, Bademosi O, Ismail H, Awada A, Dawodu A, al-Freih H, et al. A community survey of neurological disorders in Saudi Arabia: The Thugbah study. Neuroepidemiology. 1993;12(3):164-78.
12. Frank JR, Snell L, Sherbino J, editors. CanMEDS 2015 Physician Competency Framework. Ottawa: Royal College of Physicians and Surgeons of Canada; 2015.).

12. Longstreth WT, Jr., Koepsell TD, Ton TG, Hendrickson AF, van Belle G. The epidemiology of narcolepsy. *Sleep*. 2007;30(1):13-26.
13. BaHammam A, Al-shahrani K, Al-zahrani S, Al-shammari A, Al-amri N, Sharif M. The prevalence of restless legs syndrome in adult Saudis attending primary health care. *Gen Hosp Psychiatry*. 2011;33(2):102-6.
14. Wali SO, Abaalkhail B. Prevalence of restless legs syndrome and associated risk factors among middle-aged Saudi population. *Ann Thorac Med*. 2015;10(3):193-8.
15. Ohayon MM, O'Hara R, Vitiello MV. Epidemiology of restless legs syndrome: A synthesis of the literature. *Sleep Med Rev*. 2012;16(4):283-95.
16. Almeneessier AS, Alamri B, Alzahrani FR, Sharif M, Pandi-Perumal SR, BaHammam AS. Insomnia in primary care settings: Still overlooked and undertreated? *J Nat Sci Med*. 2018;1(2):in press.
17. Ahmed AE, Al-Jahdali H, Fatani A, Al-Rouqi K, Al-Jahdali F, Al-Harbi A, et al. The effects of age and gender on the prevalence of insomnia in a sample of the Saudi population. *Ethn Health*. 2017;22(3):285-94.
18. American Academy of Sleep Medicine. International classification of sleep disorders: Diagnostic and coding manual 2nd ed: Westchester. IL: American Academy of Sleep Medicine, 2005.
19. American Board of Sleep Medicine. uCoMAf. United States: American Board of Sleep Medicine; 2020. Available from: www.absm.org/.
20. BaHammam AS, Alsaeed M, Alahmari M, Albalawi I, Sharif MM. Sleep medicine services in Saudi Arabia: The 2013 national survey. *Ann Thorac Med*. 2014;9(1):45-7.
21. University Sleep Disorders Center. King Saud University Sleep Medicine Fellowship. Program Riyadh 2009 [updated 2015; Cited October 9, 2016]. Available from: ksu.edu.sa/sites/KSUArabic/Students/CurrentStds/Societies/medicalsocieties/SleepArabic/Documents/Fellowship_Program.pdf.
22. Almeneessier AS, BaHammam AS. Sleep Medicine in Saudi Arabia. *J Clin Sleep Med*. 2017;13(4):641-5.
23. BaHammam AS, Al-Jahdali H, Alharbi AS, Alotaibi G, Asiri SM, Alsayegh A. Saudi regulations for the accreditation of sleep medicine physicians and technologists. *Ann Thorac Med*. 2013;8(1):3-7.
24. Montserrat JM, Teran-Santos J, Puertas FJ. Sleep medicine certification for physicians in Spain. *Eur Respir J*. 2015;45(4):1189-91.
25. Gozal D. Accreditation of sleep medicine in the Kingdom of Saudi Arabia: A critical step toward quality outcomes. *Ann Thorac Med*. 2013;8(1):1-2.
26. American Academy of Sleep Medicine. Sleep ISR: Assessment System for Scoring Sleep Studies. American Academy of Sleep Medicine. (Available from: <https://aasm.org/professional-development/technologiststaff-training/aasmisr/>).
27. University of Texas Medical Branch (Center for Sleep Disorders). INTER-SCORER RELIABILITY; 2013. [Accessed on January 2, 2021]. Available from: https://www.utmb.edu/policies_and_procedures/Non-IHOP/Respiratory/Sleep_Disorders_Centers/Galv-%20Webster%20Inter-Scorer%20Reliability.pdfpp.
28. Governing Council Members and Education Committee World Association of Sleep Medicine (WASM). <https://worldsleepsociety.org/programs/education/>: World Sleep Society; 2012 [Accessed on January 2, 2021]. Available from: <https://worldsleepsociety.org/programs/education/>.





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